STATE OF VERMONT
PUBLIC SERVICE BOARD

Petition of twenty Vermont utilities and Vermont Public Power Supply Authority requesting authorization pursuant to 30 V.S.A. § 248 for the purchase of shares of 218 MW to 225 MW of electricity from H.Q. Energy Services (U.S.) Inc. commencing November 1, 2012 through 2038, issuance of findings that such purchases are entitled to rate recovery assurance, and requesting certain approvals under 30 V.S.A. § 108.	))))))))	Docket No. _____

PREFILED DIRECT TESTIMONY OF DOUGLAS C. SMITH ON BEHALF OF GREEN MOUNTAIN POWER CORPORATION

August 17, 2010

Summary of Testimony

Mr. Smith reviews GMP's existing power supply portfolio, its goals for new power supply arrangements, future power market prices, the price of power under the proposed HQUS PPA, and how that PPA will help GMP meet its power supply goals. Mr. Smith also explains why the HQUS PPA meets the criteria of 30 V.S.A. § 248 with respect to need, economic benefit, and consistency with Green Mountain Power's Integrated Resource Plan.

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PREFILED TESTIMONY OF DOUGLAS C. SMITH
ON BEHALF OF
GREEN MOUNTAIN POWER COPRPORATION

I. INTRODUCTION

1. Q. What is your name, occupation, and business address?

A. My name is Douglas C. Smith. I am Manager of Energy Resource Planning and Rates at Green Mountain Power Corporation ("GMP" or the "Company"), 163 Acorn Lane, in Colchester, Vermont.

2. Q. Please describe your educational background and pertinent professional experience.

A. I have worked for over 20 years in the electric industry, focusing on topics that include electric system and portfolio planning, wholesale and retail power transactions, and market price forecasting. I hold a Bachelor of Science degree in Mechanical Engineering from Brown University.

I began my career as an analyst at the Vermont Department of Public Service and was subsequently promoted to the position of Electrical Planning Engineer. From 1991 to 2007, I worked at La Capra Associates ("La Capra"), a Boston-based consulting firm that specializes in planning and regulatory issues in the electric industry, first as an analyst and ultimately as the Technical Director. While at La Capra I advised several Vermont utilities regarding their power transactions, risk management strategies, and Integrated Resource Plans. On behalf of state

agencies and large electricity customers, while at La Capra I reviewed the procurement strategies of numerous large utilities in the eastern, central and western U.S. I also led the firm's forecasting of New England wholesale electricity market prices, and assisted in the siting applications of several proposed electric generating plants.

I joined GMP in 2007 as the Manager of Energy Resource Planning and Rates. In this capacity, I play a primary role in the development of the Company's power supply strategy, and in the evaluation of potential power supply sources. I also played a primary role in the development of GMP's 2007 Integrated Resource Plan ("IRP"), which was approved by the Board in Docket 7319.

3. Q. Have you previously testified before the Vermont Public Service Board ("Board")?

A. Yes, I have testified before the Board on numerous occasions, most recently in Docket 7533 (regarding the establishment of standard offer prices under the SPEED program) and Docket 7590 (regarding a proposed long-term power purchase from the Granite Reliable wind project). I have testified regarding topics that include resource planning, proposed power contracts, electric utility rates, and potential non-transmission alternatives to proposed transmission projects.

4. Q. What is the purpose of your testimony?

A. My testimony explains the rationale for the proposed Power Purchase and Sales Agreement ("PPA") with H.Q. Energy Services U.S. Inc. ("HQUS"), why the PPA is needed, and is beneficial to GMP ratepayers, and why it is consistent with GMP's Integrated Resource Plan ("IRP").

5. Q. Please summarize your findings and recommendations.

A. My primary findings with respect to the PPA are as follows:

Need. GMP has a substantial need for new stably-priced power supply sources, primarily because the Company's two largest long-term power purchases (Vermont Yankee, and Hydro-Québec/Vermont Joint Owners Schedules B and C-3) expire in 2012 and 2015, respectively. These expiring sources presently provide over 75 percent of GMP's annual energy requirements, and most of the long-term price stability in our power supply portfolio. The PPA will provide a significant 26-year replacement source of energy, with volumes varying during six contract periods.

Economic Benefit. The PPA is consistent with GMP's Energy Plan, which focuses on low cost, low greenhouse gas emissions, and high reliability. The PPA is highly reliable, because energy supplied will be supplied during the 16 peak hours of every day, and delivery is not contingent on the performance of any particular generating units or transmission paths. The PPA also promotes GMP's goal of low-cost power, because it is one of the most cost-effective long-term

electricity sources available to GMP. The PPA provides significant price stability relative to the market by limiting exposure to potential future price increases and smoothing the annual changes in wholesale market prices. The transfer of environmental attributes and sharing of potential future revenues from any HQUS sale of attributes associated with off-peak sales over the Highgate tie creates the potential for additional value. In addition, GMP's credit requirements under the PPA are lower than a typical fixed price power purchase agreement.

IRP. The PPA is consistent with the Company's approved IRP, which supports significant amounts of cost-effective renewable generation in GMP's power supply, along with long-term imported power contracts, and specifically identifies potential purchases from Hydro-Québec as a priority resource. The PPA is needed to serve projected needs of GMP customers that could not otherwise be provided in a more cost-effective manner through energy efficiency, load management or other demand-side resources.

II. GMP'S POWER SUPPLY PORTFOLIO

6. Q. Please summarize the primary features of the Company's current power supply portfolio.

A. Most of GMP's current power supply is obtained from long-term purchased power contracts. These arrangements are complemented by a mix of owned plants (instate hydroelectric and peaking plants, along with joint ownership shares

in two out-of-state fossil-fired plants) and periodic purchases from the New England wholesale electricity market. The portfolio is characterized by a high degree of price stability, and an air emission profile that is only a small fraction of the regional average.

The primary components of GMP's current power supply portfolio are as follows:

- A long-term, fixed price power purchase agreement for approximately 103 MW on a unit-contingent basis from the Vermont Yankee nuclear plant.
- A long-term, stably-priced purchase of system power under Schedules B and C-3 of the Hydro-Quebec/Vermont Joint Owners contract. This 114 MW purchase provides a stable annual quantity of energy, at approximately a 75 percent annual capacity factor. Roughly two thirds of the energy from this source is delivered during peak hours.
- Several GMP-owned hydroelectric plants. These are primarily run-of-river sources, although some plants have a limited amount of storage. Output from these plants is significantly weighted toward spring months.
- GMP's share of in-state small power producer purchases (from a combination of hydroelectric and biomass plants) through Vermont Electric Power Producers, Inc. ("VEPPI").
- GMP-owned peaking plants, consisting of combustion turbine units (at Berlin and Gorge) and internal combustion units (at Essex and Vergennes). These plants burn primarily oil and are relatively costly to operate, so they are intended for on-demand use during hours when electricity market prices are very high or transmission system support is needed. They provide a significant amount of GMP's capacity needs, but they operate very infrequently and typically provide less than 1 percent of GMP's annual energy needs.
- A combination of joint ownership and purchased power from the Stony

Brook combined cycle plant in Massachusetts (about 47 MW in total), joint ownership in Wyman Unit 4 in Maine (about 6 MW), and 11 percent joint ownership in the McNeil wood fired facility in Burlington, VT (about 5.5 MW). The McNeil plant tends to be dispatched during most peak hours, while Stony Brook and Wyman tend to be dispatched much more occasionally. As a result, these sources presently provide only a limited share of GMP's annual energy needs.

- Long-term power purchase agreements from new renewable suppliers, which presently include the Moretown landfill and a small landfill gas project in Williston. GMP also recently received a Certificate of Public good for a long-term purchase of 25 MW from the planned Granite Reliable wind project in northern New Hampshire; this purchase is expected to begin in early 2012. Collectively, this group of sources is projected to provide between 4 and 5 percent of GMP's annual energy requirements.
- System energy purchases with durations of up to five years. These purchases, which may be round-the-clock or shaped on a seasonal or peak/off-peak basis, serve primarily to provide price stability. During 2009 and 2010, as energy market prices declined, GMP made several such purchases for deliveries beginning in 2012.
- In addition to the committed sources summarized above, GMP has recently submitted its application for a Certificate of Public Good to construct the 63 MW Kingdom Community Wind project in Lowell, Vermont. This project, net of a planned long-term sale of output to the Vermont Electric Cooperative, Inc. ("VEC") would provide 6 to 7 percent of GMP's annual energy requirements.

Exh. Pet.-DCS-1 illustrates the components of GMP's annual energy supply[1] for fiscal year 2009. While the elements of the portfolio can fluctuate from year to year (based on variances in load, generating unit outages, etc.), this recent year provides a reasonable indication of the *status quo*.

7. Q. Please describe how the Company's power supply mix is expected to change in the coming years.

A. The largest expected changes are that the Vermont Yankee and Hydro-Québec power purchase contracts (which together account for roughly three quarters of the annual energy supply) are scheduled to expire in early 2012 and late 2015, respectively. The VEPPI purchases are also scheduled to expire over approximately the next decade; the next large change will be expiration of the Ryegate wood-fired facility purchase (which represents roughly 6 MW of baseload supply for GMP) in 2012.

GMP will need substantial new power supply arrangements to replace these expiring long-term contracts, and the required amount will increase to the extent consumption by GMP's customers increases over time. **Exh. Pet.-DCS-2**

[1] Note that Exh. Pet.-DCS-1 depicts GMP's energy supply before considering the sale of renewable energy certificates ("RECs"). In 2009 GMP sold the vast majority of the RECs associated with several sources (Moretown Landfill PPA, Searsburg wind, and McNeil) which are eligible for Class 1 RPS compliance in neighboring states. As a result, an accounting of GMP's power supply in terms of its air emission profile, fuel mix, and other characteristics would replace the sold RECs with New England system power characteristics.

provides a comparison of the projected annual energy output[2] of the Company's committed power sources, plus the proposed PPA[3], to projected future energy requirements. The projection of future energy requirements, which was developed by the consulting firm Itron in Spring 2010, assumes that Vermont will continue to pursue an aggressive package of energy efficiency measures. As a result, the electricity consumption of GMP's customers is projected to increase only modestly over the long-term despite an increasing customer count.

As explained later in my testimony, GMP developed an Energy Plan that emphasizes development of a portfolio of resources to achieve three touchstone goals: low cost to customers, low carbon emissions, and reliable service (i.e., "Cost, Carbon and Reliability"). Part of this plan features acquisition (through purchases and ownership) of new renewable generation. Two proposed wind initiatives (a PPA from the Granite Reliable wind project and GMP's Kingdom Community Wind project) are part of this plan. These sources, which together are expected to provide about 10 percent of GMP's annual energy needs, are included in **Exh. Pet.-DCS-2**.

[2] GMP's committed long-term sources all entail the physical production or delivery of energy. GMP's energy needs could also be met effectively using financial arrangements; the Company has historically used such arrangements for some shorter-term purchases.

[3] This illustration depicts GMP's purchases based on the maximum potential statewide purchase amount of 225 MW in all years.

III. FUTURE ELECTRICITY MARKET PRICES

8. Q. Please discuss the major factors influencing future electricity market prices and the causes of price uncertainty.

A. My discussion of electricity prices will focus primarily on electric energy,[4] because energy costs are by far the largest component of GMP's power supply costs, and the proposed HQUS PPA will provide energy but does not include capacity. Energy market prices have historically been quite volatile, exhibiting marked fluctuations on a daily, monthly and annual basis. The primary reasons for this historical volatility, which are also reasons why electricity prices will continue to be volatile in the future, include the following:

- Electricity market prices in New England and other regions are generally determined by the marginal price of production – essentially the highest-priced resources needed to meet electricity demand. The costs associated with plants operating on the margin vary widely, based on the range of technologies and fuels used.
- Fuel prices for price-setting electric generators (in New England, primarily natural gas, with lesser fractions of oil and coal) are quite volatile.
- Regulatory uncertainty, particularly with respect to air emission regulations and other environmental requirements, can affect electricity market prices.
- Electricity cannot be easily stored on a regional or national basis - at least in sufficient quantities to smooth out the differences between relatively high-priced and low-priced hours.

[4] The reference to energy is limited to electric energy, as opposed to other fuel sources such as wood or fuel oil which are also consumed directly by end users.

Exh. Pet.-DCS-3 illustrates the variance in the monthly average energy spot market prices (for the peak or "5x16" period) in the New England electricity market (at the Massachusetts Hub and Vermont Load Zone locations) from 2003 to the present. It should be noted that the variation in prices for individual days and hours is much greater than the monthly averages shown here.

Like the spot market prices for energy, the prices for energy to be delivered in the future are also volatile – sometimes even more so. **CONFIDENTIAL Exh. Pet.-DCS-4** illustrates the variance of forward energy market prices since 2008, for deliveries at the Massachusetts Hub location in calendar years 2010 through 2014. The values in each series represent the prices at which deliveries for the peak hours in a given calendar year could have been purchased in advance, over a range of trading dates up to several years in advance of delivery. For example, the 2010 series indicates that the market price for peak energy for delivery in calendar year 2010 would have cost as much as $116/MWh (if purchased in mid-2008) or as little as $55/MWh (if purchased near the end of 2009).

The historical variance of both spot market and forward market prices demonstrates that energy market prices can change significantly over periods as short as a few months. Large changes in forward market prices are caused, in part, by changes in expectations relating to factors that significantly influence market prices, including natural gas prices, electricity demand, and environmental

regulations. In the future, these factors (particularly natural gas prices and the potential for national regulation of greenhouse gas emissions in the electricity sector) have the potential to produce similar or even greater price uncertainty. This means that the price of energy to meet GMP's projected future requirements is quite uncertain, particularly for the period after 2015 in which the majority of GMP's needs are not yet covered with committed sources. As a result, based on the currently committed power supply portfolio, the potential range of GMP power supply costs (and therefore the range of electricity rates that GMP customers could potentially pay) is substantial.

9. Q. Please summarize GMP's current long-term outlook for future energy market prices.

A. GMP's June 2010 base case energy market price outlook (for the "7x16" hours) is set forth in **CONFIDENTIAL Exh. Pet.-DCS-5** (constant 2010 dollars) and **CONFIDENTIAL Exh. Pet.-DCS-6** (nominal dollars). The base case, which is intended to reflect a reasonable "most likely" single outcome, was selected by GMP in consultation with La Capra Associates.[5]

The following are major input assumptions and results associated with the GMP base case:

[5] La Capra is a Boston-based consulting firm that has assisted GMP in several power supply planning efforts in recent years, including the development of GMP's 2007 IRP. La Capra also assists other Vermont utilities on power planning and transaction matters, and is well-grounded in the region's wholesale power market.

- Henry Hub natural gas prices of between $5 and $7 per MMBtu (in $2010) over the next decade, increasing to $8 per MMBtu (in $2010) by 2030. The basis differential to New England is assumed to decline substantially from past levels, due to the emerging role of Marcellus shale supply and the commissioning of new liquefied natural gas import capacity in New England;
- Electricity demand in New England based on the 2009 NEPOOL Capacity, Energy, Load and Transmission ("CELT") 50/50 case, less estimated energy efficiency program savings estimated by La Capra Associates;
- Additional New England new renewable electricity generation and imports over the next decade sufficient to meet projected renewable portfolio standard ("RPS") requirements in neighboring states;
- General inflation of about 1 percent per year in the next two years, increasing thereafter toward a long-term trend of about 2.7 percent per year from 2017 forward.
- An increasing likelihood over time that a national program substantially limiting greenhouse gas emissions in the electricity sector, such as the "Waxman/Markey" bill, will be implemented. The base case outlook assumes that electric generators must purchase emission allowances to cover their CO_2 emissions beginning in the relatively near future, with market prices for the allowances doubling between 2020 and 2030;
- Near-term all-hours energy market prices well below $60/MWh;
- In the near term, a decline in New England electricity market prices relative to U.S. natural gas prices. This is due, in part, to the build out of new renewable sources noted earlier and to the assumed decline in New England gas prices relative to the rest of the country;
- Electricity market prices over the longer term increasing faster than the rate of general inflation. This is due in part to slowly increasing natural gas prices, along with the addition of CO_2 allowance prices and increases over time.

10. Q. How does the GMP base case energy market price outlook compare to other recent forecasts?

A. As **CONFIDENTIAL Exh. Pet.-DCS-7** shows, over the long term the GMP base outlook is significantly lower than several other price forecasts that were produced in the past year, except for a forecast that assumed no national price for CO_2 emissions by electric generators (i.e., through national greenhouse gas emission limits). GMP's lower outlook is substantially attributable to lower assumed natural gas prices (based, in part, on GMP's use of more recent information) and lower assumed CO_2 allowance prices. Specifically, GMP chose a moderate base case outlook for CO_2 allowance prices to allow for the a possibility that national greenhouse gas limits will not be applied to the electric industry, that such limits could be applied on a delayed basis, or that the resulting allowance prices may be limited by technological advances, market design, or other factors.

IV. GMP'S POWER SUPPLY STRATEGY

11. Q. Please describe GMP's resource procurement strategy.

A. GMP has developed an Energy Plan that emphasizes development of a portfolio of resources to achieve three touchstone goals: low cost to customers, low carbon emissions, and reliable service (i.e., "Cost, Carbon and Reliability"). The plan includes the following components, which generally involve the pursuit of resources where Vermont utilities may have unique leverage or opportunities:

- Meaningful purchase and construction of new renewable generation;
- A long-term, cost-effective purchased power contract in declining amounts from Vermont Yankee if relicensed operation is determined to be safe and reliable;
- A long-term, cost-effective power contract with Hydro-Québec;
- Additional investments in cost-effective energy efficiency and demand-side management;
- Deployment of intelligent devices throughout the GMP system to improve the effectiveness of GMP operations, provide customers with usable consumption data, and support rate structures and other arrangements that enable customers to optimize their energy use;
- Exploration of opportunities to increase transmission capacity to import from Hydro-Québec or other low-emission resources.

12. Q. Are the elements of this strategy consistent with GMP's Integrated Resource Plan ("IRP")?

A. Yes, they are. The Company's 2007 IRP (which was approved in 2008) featured scenario and sensitivity analyses that evaluated a range of potential portfolio strategies from the perspectives of projected costs, potential cost variance, air emissions, and flexibility. The IRP indicated that the resource portfolios of choice would likely include significant amounts of Hydro-Québec, new renewable generation (to the extent that it could be developed or purchased cost-effectively), and Vermont Yankee, because they presented the best opportunity to dramatically reduce exposure to uncertain fossil fuel prices, although exposing GMP to above-market costs if market prices turn out relatively low. GMP IRP at 97, 99. The IRP action plan included (among other items) exploring opportunities for new

renewable power sources, and for a potential future contract opportunity with Hydro-Québec. GMP IRP at 104-105.

13. Q. What are GMP's goals with respect to building long-term price stability into its power supply portfolio?

A. Approximately 90 percent of GMP's historic power supply resources - including Vermont Yankee, Hydro-Québec, GMP-owned hydroelectric plants, VEPPI purchases, and GMP's joint ownership in the McNeil generating plant - involve prices that are fixed, relatively stable, or not tied closely to the wholesale market. The remaining 10 percent has been obtained primarily from periodic forward energy market purchases and from GMP's participation in the Stony Brook and Wyman plants. As a result, GMP's portfolio has been largely insulated from market price changes and has been much more stable than those of utilities in neighboring states (which generally purchase generation on a much shorter-term basis). This has tended to make GMP's power supply costs and retail rates among the lowest in New England during periods of high market prices, and less competitive during periods when market prices are low.

Looking forward, GMP seeks to develop a portfolio that continues a very high degree of price stability in the near term (i.e., within one to two years of delivery). Over the longer term (i.e., 10 years in advance), GMP seeks a substantial degree of price stability but somewhat less than in the past. The HQUS PPA provides

greater long-term price stability than purchases from the market, but limits the degree to which the PPA could turn out to be above market.

14. Q. Please summarize GMP's recent efforts to implement the goals of the IRP and its Energy Plan.

A. During the past several years GMP has pursued new renewable generation, through long-term power purchase agreements with new renewable electricity sources (by means of bilateral discussions and a formal solicitation process) and has explored options to own new renewable power sources.

For example, in collaboration with Central Vermont Public Service Corp. ("CVPS") and VEC, GMP participated in a widely distributed and inclusive Joint Utilities Request for Proposal process ("RFP#1"), which resulted in proposals from bidders in early 2009. The primary objective of the RFP was to attract proposals from all resource types and from resources that might otherwise not participate in a smaller solicitation, by requesting up to 100 MW (among the participating utilities) starting in 2012. The quality and variety of responses exceeded our expectations as thirty-three proposals were received representing over 1,800 MW of supply in virtually all fuel-type categories, including over 400 MW of offers from new renewable resources. As a result of this process, GMP entered into a long-term agreement to purchase 25 MW beginning in 2012 from the proposed Granite Reliable wind project in northern New Hampshire. The

Board recently granted a Certificate of Public Good for this purchase in Docket 7590.

GMP has also engaged in bilateral discussions with numerous proposed premium renewable projects in Vermont and neighboring states. These include other wind projects, along with projects based on other production technologies that include solar, new-build biomass, and retrofits of existing biomass plants.

GMP has also pursued ownership of renewable generation. The Kingdom Community Wind project is clearly the Company's largest initiative with respect to renewable generation ownership. If constructed, that project would be GMP's largest renewable electricity plant, with an expected average annual output that would exceed the combined average annual output of GMP's existing hydroelectric plants. In addition to its efforts to develop the Kingdom Community Wind project, GMP is presently pursuing three potential solar projects with a total capacity of about 470 kW. In the past several years, GMP has also increased the capacity and associated energy output at its Essex and Vergennes hydro plants, in amounts of several hundred kW each, which increased aggregate energy output by several thousand MWh per year. We continue to explore improvements at other GMP-owned hydro sites.

GMP also has sought to purchase power from the Vermont Yankee plant, to the extent it is relicensed, but no agreement has yet been reached.

V. THE PPA

15. Q. Please describe the amount of GMP purchases under the PPA.

A. The contract is described in detail in the Prefiled Testimony of Bill Deehan and Chris Cole.

Based on the maximum total PPA amount of 225 MW, GMP's purchases under the PPA will begin at about 7 MW starting in November, 2012, increasing to about 67 MW in November, 2015, to 77 MW in November 2016, and to 81 MW in November 2030. GMP's purchase volumes will decline in 2035 to about 21 MW, and end in 2038. The energy volumes under the PPA represent about 22 percent of GMP's projected annual energy requirements in 2017.

For context, GMP's share under Schedules B and C-3 of the current HQ/VJO contract is 114 MW (roughly 750,000 MWh/year, which represents about 37 percent of GMP's current energy requirements), whereas its maximum PPA share will be approximately 81 MW (about 473,000 MWh per year). Note that the difference in energy volumes reflects the fact that the current HQ/VJO contract features energy deliveries at a 75 percent annual capacity factor, while the PPA

will feature "7x16" deliveries which represent about a 67 percent annual capacity factor.

16. Q. Please describe the projected price of power under the PPA.

A. Based on recent forward market price indications, along with the other components of the PPA pricing formulae, I estimate that the price of energy under the PPA in 2013 (its first year of delivery) would be approximately $60/MWh. **CONFIDENTIAL Exh. Pet.-DCS-8** identifies the projected annual price of PPA energy, along with the PPA reference price line and projected wholesale energy market prices.

17. Q. How will the price of power under the new PPA compare to the price of power under the current HQ/VJO contract?

A. Before addressing this question I should note that this comparison is offered for context. It is not an appropriate test of the reasonableness of the proposed PPA's pricing because (among other reasons) the two purchases were negotiated over 20 years apart, in two entirely different electricity market environments. Further, the two purchases feature significantly different pricing structures and risk profiles. The PPA should be evaluated based on today's market environment, outlook, and alternatives; a comparison to the HQ/VJO contract is primarily useful as context for GMP's future retail rate path.

In 2015, the last year in which GMP will purchase power under the HQ/VJO Contract, the projected price of power under the PPA is comparable to the projected HQ/VJO price, after adjusting for the facts that the PPA will not include capacity, and its energy will be delivered in a "7x16" profile that should be somewhat more valuable per MWh. This continuity in prices means that replacement of a substantial portion of GMP's current HQ/VJO purchases with the proposed PPA would not put any meaningful upward pressure on GMP's power supply costs and retail rates in the near term.

VI. ECONOMIC BENEFIT

18. Q. Please summarize the categories of economic benefit to the State and its residents associated with the PPA.

A. The PPA is very consistent with GMP's Energy Plan objectives of low cost, low carbon and high reliability. It is expected to provide economic benefits for the following reasons:

- The PPA price is expected to be favorable relative to the forecasted price of market power, and lower than the price of currently-available power sources with similar characteristics;
- The PPA pricing formula will provide a substantial degree of price stability relative to the wholesale power market, while also limiting the degree to which the PPA price could turn out above market if future market prices decline;
- The energy provided under the PPA is expected to be highly reliable, because as an IBT product, it is not subject to interruptions (due to transmission contingencies or generating unit outages) that many other power sources are;

- The PPA includes transfer of environmental attributes based on energy physically delivered into New England, and a sharing of any revenues from HQUS sale of environmental attributes related to energy deliveries over the Highgate tie other than PPA deliveries. Each of these features has the potential to be a source of additional value over the PPA's 26-year term; and
- The credit requirements imposed on GMP under the PPA are also favorable.

1. PRICE COMPARISONS

19. Q. Please summarize the basis for your conclusion that the PPA is likely to result in prices that are competitive with future market prices and prices associated with currently-available alternatives.

A. As described below, the PPA is projected to be one of the most cost-effective long-term electricity sources available to GMP. The projected price of power is favorable when compared to GMP's current reference case wholesale energy price outlook, when evaluated in a probabilistic long-term risk analysis, and when compared to currently-available alternatives.

a. <u>Comparison to Projected Market Price</u>

20. Q. How does the projected PPA price compare to projected energy market prices?

A. Working with La Capra, I applied GMP's long-term power planning risk analysis to explore how potential outcomes for future natural gas and oil prices, federal climate change legislation, and economic activity could affect electricity market prices, the PPA's performance, and GMP's power supply portfolio. The risk

analysis is used to estimate the cost of power under the PPA, and PPA costs relative to the market on a net present value basis under a range of potential future electricity market prices.

The risk analysis is based on a probabilistic framework and a wholesale electric market simulation model, and produces multiple market price forecasts based on unique combinations of key drivers of regional electricity prices. Specifically, we began by defining distributions of potential long-term outcomes for each of several key energy market price drivers: natural gas and oil prices, carbon prices, and electricity demand.

- Variations in projected natural gas prices reflected the potential impacts of development of shale gas, drilling restrictions due to environmental concerns and greater regulation of the natural gas industry. We assumed a wide distribution of potential future natural gas price outcomes, centered around our Base Case assumption.
- With respect to national regulation of greenhouse gas emissions in the electricity industry, we developed a discrete distribution of potential CO_2 allowance prices to reflect five potential outcomes with respect to the timing and strictness of greenhouse gas emission regulation (including the potential that no such regulation will be implemented).
- Variations in oil prices primarily reflect the dynamics of the world oil market. The distribution is assumed to be wide and skewed to the high side, to reflect a somewhat higher probability of very high-price outcomes relative to very low-price outcomes. The mean of the distribution is the base case assumption.

i The regional electricity demand distribution is assumed to have a normal shape, and a width that is derived from the NEPOOL CELT high and low economic growth forecasts.

A Monte Carlo simulation technique (consisting of draws from each of the driver variable distributions noted above) was then used to create forty specific scenarios. To enhance the reasonableness of the Monte Carlo analysis (i.e., to increase the likelihood that the drawn outcomes for the driver variables will reflect internally consistent futures, and to reduce the likelihood of mutually inconsistent ones), we assumed correlations between the key driver variables. For example, positive correlations were assumed between national regulation of greenhouse gas emissions and natural gas prices, and between electricity demand and natural gas prices. **CONFIDENTIAL Exh.Pet-DCS-9** summarizes the major input assumptions used in the risk analysis for the key market drivers, along with the corresponding GMP Base Case values.

A commercial regional electricity market simulation model[6] was then used to estimate regional and Vermont-specific energy prices under each of these scenarios. Based on these results, projected market prices and PPA prices over the PPA term were compared on a net present value basis. The PPA performance under each scenario was ranked from lowest value (i.e. PPA price least favorable to market) to highest value in a cumulative distribution. The resulting range of

[6] La Capra licenses the AURORAxmp electric market model, which simulates the dispatch of the regional electricity system and the formation of market prices on an hourly basis, from EPIS, Inc.

PPA performance reflects a risk profile that illustrates a credible range of potential outcomes and the approximate likelihood of various outcomes within the range.

21. Q. What were the results of the risk analysis?

A. **CONFIDENTIAL Exhibit Pet-DCS-10** presents the results of the risk analysis for the proposed PPA, in the form of a cumulative distribution curve showing the forty scenarios drawn in the risk analysis.[7] The exhibit also includes two single cases that I think are useful as context for evaluating the distribution: the GMP Base Case that I discussed earlier, and (to provide an indication of how much of the PPA's value is associated with protection against future emission regulation) the GMP Base Case modified to exclude any national greenhouse gas emission limits. The following are highlights of the results:

- Under the GMP Base Case, the projected cost of energy under the PPA is favorable, relative to projected market prices over the 26-year term.
- The mean and median of the PPA's projected performance in the risk analysis are similar to the GMP Base Case results.
- The result of the "no greenhouse gas limits" case illustrates that a substantial portion of the projected value of the PPA derives from the protection it provides against potential future market price increases driven by national greenhouse gas emission limits (which could put a significant price on emissions in the electric sector), although the PPA is still projected to be cost-effective in the absence of any such limits.

[7] The analysis is based on the 218 MW statewide PPA amount; the benefits of the PPA would increase if the 225 MW statewide PPA amount were used in the analysis.

22. Q. Are there other beneficial impacts of the PPA not reflected in the risk analysis?

A. Yes. There are potential benefits associated with the delivery of low-emission HQ power into the ISO-NE market, which would displace marginal fossil-fired resources (primarily gas). These benefits include displacement of air emissions; suppression of locational marginal prices ("LMP") and achievement of regional/national air emission targets. Although physical deliveries of energy into New England are not required for the IBT product, all environmental attributes transferred under the PPA will be associated with physical deliveries of HQ power to New England, which provide the system benefits cited above.

23. Q. Does the lack of a capacity component under the PPA substantially undermine its value to GMP customers?

A. No. The PPA is an appropriate and attractive addition to GMP's portfolio based on the energy and attributes that it will provide, notwithstanding the fact that it will not include capacity. This is due in part to the fact that energy is, by far, the largest cost component of GMP's future power purchases and of the uncertainty in GMP's future power costs. It is also notable that the New England capacity market presently features a meaningful capacity surplus, with the potential for moderate clearing prices in the ISO-NE Forward Capacity Auctions to persist for some time.

GMP is, of course, planning for its capacity needs. Since the PPA will not provide capacity, and the wind sources that GMP is planning to add to its portfolio are expected to provide only limited capacity value, I expect that GMP's planning and procurement focus on the capacity product will increase in the coming years. Aside from the ISO-NE forward capacity auctions, which represent a reasonable default source of capacity, there are many other potential sources of capacity, primarily including PPA purchases that combine energy and capacity, bilateral purchases of capacity only, and construction of instate generating capacity, which should enable GMP to manage its capacity requirements cost-effectively.

24. Q. Did you also analyze how the addition of the PPA will affect the performance of GMP's power supply portfolio as a whole?

A. Yes. Using the risk analysis framework and the distribution of simulated potential future electricity market price outcomes I discussed earlier, GMP projected its total future energy costs for two illustrative portfolios: (a) existing and planned sources (including the proposed Granite Reliable wind PPA, the proposed Kingdom Community Wind project, and GMP's share of 50 MW of standard contract SPEED projects); and (b) the same portfolio, plus the PPA. In each portfolio, all supplies not provided by the specified GMP sources are assumed to be purchased each year at then-current market prices.

The results of this analysis are illustrated in **CONFIDENTIAL Exhibit Pet-DCS-11,** in the form of a cumulative cost distribution for the two illustrative GMP portfolios. The chart, which depicts the projected net energy costs for GMP's portfolio for the year 2020, shows that adding the proposed PPA to the GMP portfolio produces a narrower range of potential portfolio costs. That is, introduction of the PPA produces a portfolio with more stable costs that are less subject to potential changes in future market prices. Addition of the PPA also moves the distribution of power costs somewhat to the left because under most of the simulated market price outcomes for 2020, the PPA price is projected to be favorable relative to market. This combination of results is desirable for customers, and is not common among power supply options.

25. Q. How does the projected price of energy under the PPA compare to GMP's current outlook for the energy's future market value?

A. The projected price of energy under the PPA is favorable relative to GMP's Base Case market outlook for the energy over the contract term. **CONFIDENTIAL Exh. Pet.-DCS-8** illustrates GMP's Base Case market outlook and the PPA price on an annual basis. **CONFIDENTIAL Exh. Pet.-DCS-10** identifies the projected cost of PPA energy over the contract term relative to GMP's Base Case market outlook. Notably, each of these analyses values the PPA strictly as a

source of wholesale energy. They do not assign any value to the associated generation attributes that GMP will receive.

The Highgate sales point is also a beneficial aspect of the PPA. In general, power supply sources located within the state tend to be more effective hedges against future electricity market price changes than out-of-state sources. The energy revenues (i.e., locational marginal prices or LMPs) for instate sources are more likely to be well correlated with the Vermont load zone prices that Vermont utilities pay to meet their load requirements. This is an advantage for the PPA relative to more distant potential sources, although it is not quantified in GMP's cost-effectiveness analysis. In addition, to the extent that HQ supports its sales under the PPA with imports over the Highgate Converter, then LMPs in Vermont will likely be suppressed. This will tend to be a beneficial outcome for Vermont distribution utilities like GMP whose Vermont load obligations exceed their Vermont generation sources.

b. <u>Comparison to Other Available Sources</u>

26. Q. How do the projected price of power and other characteristics of the PPA compare to alternative potential power sources?

A. As I mentioned earlier, GMP has explored numerous potential power supply sources during the past several years. The PPA is a preferred resource because it is one of the most cost-effective long-term power sources available, it fits a clear

need in GMP's power supply portfolio, and its non-price characteristics are also favorable.

There are a number of alternative potential power sources available to GMP, representing a range of technology and fuel types, delivery profiles, and operating roles. Although some of them are difficult to compare directly to the PPA, none of the resources containing non-price characteristics similar to PPA appear to be as cost-effective as the PPA.

GMP has explored the following power supply options within the past two years, through a combination of formal solicitations and bilateral dialogue with potential sellers.

- Purchases of output from existing hydroelectric plants in the region, including other potential purchases from Hydro-Quebec;
- Utility scale new renewable generation plants, including wind, biomass, landfill gas and solar;
- Smaller scale new renewables;
- Enhancements to GMP hydroelectric plants;
- Natural gas-fired combined cycle power (from proposed and existing plants);
- Forward energy purchases (e.g., peak/offpeak/7x24 blocks) from the New England market;
- New peaking capacity (i.e., simple cycle combustion turbines or internal combustion engines), particularly at GMP generation sites;
- A purchase of output from the Vermont Yankee nuclear plant.

Exh. Pet.-DCS-12 compares the power supply options in terms of a range of characteristics that GMP uses to compare and evaluate potential power supply sources, based on GMP's recent experience seeking to purchase and/or construct those options. The relative attractiveness of these potential supply sources, and their suitability as alternatives to the proposed PPA, can be summarized as follows:

- The PPA is projected to be cost-competitive with wholesale power in New England, while offering many favorable other characteristics (low air emissions, relative price stability, renewable fuel, not unit-contingent, and the potential for power system benefits).
- GMP is pursuing solar photovoltaic power projects and enhancements to GMP hydro plants where they are cost-competitive with other new renewable resources, but these sources are not available on a scale comparable to the PPA.
- Utility scale wind projects have proven to be the most cost-competitive, large-scale new renewable sources. GMP is presently pursuing the Kingdom Community Wind project and has entered into a long-term purchased power agreement from the Granite Reliable wind project in New Hampshire. Together, these sources would provide approximately 10 percent of GMP's annual energy needs.
- To date, we have not identified any cost-competitive long-term purchase opportunities from existing hydroelectric plants, at least in substantial volumes.
- Although new combined cycle generation is the type of resource most similar to the PPA from the perspective of scale and output profile, it appears to be significantly more costly, less stably-priced and is fossil-fired, rather than renewable.

i Forward energy purchases from the regional market are available in flexible amounts and delivery profiles, but they feature relatively high air emissions, and are not a feasible source of long-term price stability.

For these reasons, the PPA compares favorably to currently available alternatives available to GMP, and represents an appropriate resource to meet part of GMP's projected resource needs.

2. PRICE STABILITY

27. Q. Please describe the price stability benefits of the PPA.

A. The PPA provides significant price stability relative to the wholesale power market, in several ways. First, because the PPA price adjustments are based in part on the reference line, which escalates with general inflation (which is much less volatile than power market prices), the PPA will provide an effective (although not complete) hedge against future changes in market prices. It will provide meaningful mitigation for GMP customers against the types of outcomes that could increase GMP power supply costs (e.g., high natural gas prices, a national program to limit greenhouse gas emissions in the electric sector) and, therefore, retail rates. To the extent that the rate of general price inflation is less than future market prices increases, the PPA adjustments will be lower than those increases.

Second, for the portion of the PPA price that is linked to electricity market prices, the pricing formula will smooth annual changes in those prices by using the market price index that is described in the Deehan-Cole testimony. This will tend to damp the year-over-year price changes.

Third, under the terms of the PPA, the potential year-over-year change in the PPA price is capped.

In summary, while the PPA price features a market-based component and will be subject to year-to-year fluctuations, it will serve to increase the price stability of GMP's power supply portfolio, particularly in the long term. I should note here that even if the price of PPA power turns out to be above market for an extended period, the effect on customers is likely to be offset by lower prices for other GMP sources. This is because, as I mentioned earlier, GMP's portfolio will likely not consist entirely of stable-priced sources. Rather, a significant fraction of GMP's portfolio (e.g., future market purchases, fossil-fired generating plants, market-indexed power purchase contracts) is expected to decline in price along with the market to a meaningful degree.

28. Q. Since the PPA pricing structure contains a component that is linked to electricity market prices, what is your sense of how the price of PPA power may vary from year to year?

A. Electricity market prices are notoriously volatile (as indicated, for example, in **Exh. Pet.-DCS-3** and **CONFIDENTIAL Exhibit DCS-4**). Therefore, although the PPA pricing structure will greatly mute the effects of market price changes, I expect the PPA price to typically fluctuate meaningfully (i.e., at least several percent, often more) from year to year. The specific variance of the PPA price will, of course, depend largely on how strongly market energy prices vary from year to year, based on cyclical factors and long-term trends. A very substantial movement in market prices would be needed to trigger the PPA's cap in year-over-year price changes, but movements of this magnitude have occurred in the past, and my sense is that the cap could be triggered on at least an occasional basis during the PPA's term.

3. RELIABILITY

29. Q. Why do you conclude that the PPA provides reliability benefits?

A. The PPA is highly reliable, because energy will be supplied during the 16 peak hours of every day. In addition, the IBT transaction structure means that delivery is not contingent on the performance of any particular generating unit or transmission path. It is therefore far more reliable than typical unit contingent purchases, including those from many renewable resources.

4. ENVIRONMENTAL ATTRIBUTES

30. Q. Please describe the economic benefits associated with the transfer of environmental attributes.

A. At present, the environmental attributes from "premium" new renewables that qualify for compliance with Class 1 RPS requirements in New England states are the most valuable. These attributes, in the form of NEPOOL GIS certificates, command a substantial price ($15/MWh to $40/MWh in recent years). Attributes associated with HQ system power (primarily large existing hydro) presently are not accurately recognized by the NEPOOL GIS system, and they do not qualify for New England RPS programs. We therefore would expect to retire the attributes in the near term, claiming the low-emission and renewable features of the power as part of GMP's power supply.

It is possible that at some point in the future, HQ system power attributes will be eligible for RPS purposes and accurately recognized by the NEPOOL GIS system. If this occurs, GMP will assess whether to retire the attributes or sell them and use the net revenues to reduce retail electricity rates (as GMP presently does for most of its premium renewable sources, consistent with the SPEED program).[8] Under the terms of the PPA, any such revenue would be shared with HQUS, so GMP would credit the net amount to consumers in the company's cost of service. This

[8] These premium renewable sources include the Searsburg wind plant, long-term PPAs from the Moretown landfill facility and a farm methane project, the McNeil plant, and upgrades to GMP hydroelectric plants. GMP retires sufficient premium RECs from instate renewable sources to cover the consumption of its retail green rate subscribers.

choice may depend, in part, on the market value of the attributes as well as whether Vermont adopts a traditional RPS program similar to those in neighboring states, which require the retirement of renewable energy certificates ("RECs") associated with the eligible renewable generation sources.

In summary, although the HQ system power attributes may not have a material market value today, it is possible that they will in the future, in which case the PPA will provide additional value to Vermont customers, above the wholesale market value of the energy. The PPA cost-effectiveness analysis that I presented earlier does not assume any such value.

5. CREDIT REQUIREMENTS

31. Q. Please describe the economic benefits associated with the credit requirements.

A. The PPA requires that the buyer provide collateral at any point during the term based on the formula identified in the Deehan-Cole testimony, less a collateral threshold amount. Although this type of requirement is typical of stable-priced energy contracts, the credit provisions described in the Deehan-Cole testimony are beneficial from the buyer's perspective. In GMP's experience, the combination of these provisions distinguish the PPA from other potential long-term sources, and they help to make a long-term purchase of this type fiscally

feasible. HQUS' performance under the PPA is also backed up by a guaranty of Hydro-Québec, one of the largest power suppliers in North America.

Together, these terms help to make the PPA a feasible stable-priced and long-term power supply source for GMP's customers. In absence of these terms, the PPA's credit requirements on GMP could, depending on future events, be prohibitive.

VII. POTENTIAL RISKS ASSOCIATED WITH THE PPA

32. Q. You mentioned earlier that it is possible that the price of power purchased under the PPA will turn out to be higher than future market prices. What are the primary factors that could cause this to happen?

A. The PPA price could be above market if the starting price turns out to be higher than actual market prices at the beginning of the PPA or if future power market prices experience a sustained decline relative to the rate of general inflation. The primary way this could occur is a decline in power prices, relative to the 2013 forward prices that are used to set the starting price.

First, I should note that the risk of the PPA turning out above market on a sustained basis is mitigated to some degree by the fact that its pricing is being established at a relatively favorable time from a historical perspective, when market prices are lower than they have been in many years (see Exhibits Pet-DCS-3 and DCS-4). Nevertheless, it is clearly possible that future electricity

market prices will decline in real terms. In my view, the most likely causes of such an outcome would be some combination of:

- Low natural gas prices – for example, if the volume of U.S. gas shale production turns out to be higher than current expectations.
- No national program to limit greenhouse gas emissions, or a program that results in very low emission allowance prices.
- An increase in the supply/demand balance in the regional electricity market, due to factors such as flat or declining electricity demand in the region, substantial additional renewable supplies (without major retirements of existing generating plants) or significant new supplies from neighboring markets.

These are the types of risks that were tested in the risk analysis I described earlier. In that analysis, the least favorable outcomes for the PPA reflect a combination of these factors (e.g., no national price on CO_2 emissions, in combination with long-term natural gas prices well below today's expectations).

Another outcome that could contribute to the PPA price turning out above-market would be a "spike" in the forward market for 2013 deliveries to levels that cause the reference price to be set meaningfully higher than today's expectations. This risk is partially mitigated by the fact that much of the information necessary to calculate the starting price is already known. In addition, by the time the Board completes its review of the PPA in the instant docket, the starting price will be established, essentially resolving this current risk.

33. Q. Is higher than expected U.S. inflation also a risk factor for the PPA's performance?

A. Yes. A relatively high rate of inflation could conceivably cause the PPA price to escalate faster than power market prices, causing the PPA to turn out above market. To help assess this risk, GMP consulted with Economic & Policy Resources, Inc. ("EPR"), a Vermont-based economic consulting firm. Based in part on EPR's insights, GMP's primary observations with respect to the inflation risk are as follows:

- Our base case inflation assumptions (averaging below 2% per year in the near term, increasing to a long-term rate of about 2.7% per year) were taken from EPR's spring 2010 outlook, which is consistent with concurrent indicators from the government bond market;
- Sustained annual inflation of 3.5% or greater in the current economic environment would constitute high inflation. Inflation expectations approaching this level (or even lower) would likely compel policy action from the Federal Reserve to slow inflation and reduce expectations of future inflation;
- Higher inflation outcomes than our base case assumption could clearly occur - driven by factors that include continued federal government deficit spending and associated borrowing requirements, a weak U.S. dollar, and/or a reduction in independence at the Federal Reserve which could undermine its ability to take politically unpopular actions to fight inflation;
- In relative terms, the range of uncertainty in future power market prices over the PPA term appears to be significantly wider than the uncertainty in the inflation index used in the PPA. This is consistent with experience in recent years (see, for example, the ranges of spot and forward energy market prices in **Exh. Pet.-DCS-3** and **CONFIDENTIAL Exh. Pet.-DCS-4**) and over the past decade or more.

- Notably, higher than expected general inflation across the U.S. economy (affecting electricity market price drivers like natural gas prices) would not necessarily erode the PPA's cost-effectiveness relative to the wholesale market. That is, a high-inflation future could increase both the PPA price and the value of the PPA's output by similar amounts.
- Erosion of the PPA's projected value relative to market would require a much more extreme outcome - a significant and sustained divergence between the inflation index and the escalation in wholesale market price drivers. While such an outcome is possible, the likelihood appears to be quite low.

With respect to the performance of the proposed PPA, the considerations above indicate that the risk (in terms of its probability and potential magnitude) of higher than expected inflation warrants consideration, but that it is likely substantially less than the risk of lower than expected power prices (which GMP tested in detail in the risk analysis). In either type of adverse outcome (i.e., low power market prices or high inflation), the PPA pricing formula (i.e., the market adjustment component) will limit the amount by which the PPA might be above market.

34. Q. Do these risks that you have outlined above indicate that the PPA is not an appropriate supply source for GMP?

A. No, not in my judgment. The PPA is one of the most cost-effective new long-term resources that GMP has encountered, and I believe that the market outlook that we have used to evaluate it is reasonable and appropriate based on the

information available today. Although there are no guarantees, I believe that over its life the PPA is more likely than not to turn out to cost less than wholesale market prices for power for the same profile and location. It is also important to keep in mind that GMP's primary rationale for entering into the PPA is not to "beat" the single stream of market price outcomes that actually occurs in the future (or today's outlook for those prices), but rather to bring price stability to GMP's portfolio relative to the market at a reasonable price – thereby helping to manage the exposure of GMP's customers to the range of uncertain future market outcomes. If, however, in the Board's judgment this proposal does not represent a prudent hedge, it would be helpful if the Board determined that and provided further direction to GMP and the other PPA buyers to guide their selection of other resources.

VIII. SECTION 248 CRITERIA

35. Q. Does the HQUS PPA meet a need for present and future demand for service that could not otherwise be provided in a more cost effective manner through energy conservation programs and measures or energy efficiency and load management measures, as required under (30 V.S.A. § 248(b)(2))?

A. Yes. As I have explained, about three quarters of GMP's current power supply sources will expire between 2012 and 2015, leaving GMP with a need for substantial new resources, particularly long-term resources that provide relative price stability. After accounting for the planned Granite Reliable PPA and the

proposed Kingdom Community Wind project, GMP's projected open position from 2017 forward is still over 70% of our annual energy requirements. The proposed PPA would provide roughly 20% of GMP's annual energy requirements, leaving about half of those requirements to be met with future resources including energy efficiency and load management measures.

As the Board recognized in the recent Granite Reliable Power decision, although it is reasonable to expect that additional amounts of energy efficiency can be obtained at a cost that is lower that power supply alternatives, it is unrealistic to expect that energy efficiency or other demand-side resources could meet GMP's resource needs, due to the size of the resource needs, the historically aggressive pursuit of energy efficiency in GMP's territory, and the prospect of increased future efficiency costs. *Petition of Green Mountain Power Corp.*, Docket No. 7590 (Vt. Pub. Serv. Bd. May 13, 2010) at 7.

Under the PPA, if a Buyer fails to receive required approvals (such as from the Board), that Buyer's allocation becomes available to the other Buyers. In light of the projected magnitude of GMP's supply deficiency reviewed above, GMP seeks Board approval to increase its PPA share by up to an additional 10 MW, if another Buyer's allocation becomes available.

36. Q. Does the HQUS PPA result in an economic benefit to the state and its residents, as required by 30 V.S.A § 248(b)(4)?

A. Yes. As indicated above, the contract will benefit GMP's power supply portfolio in a number of ways (including relative long-term price stability, reliability relative to unit contingent resources and favorable credit requirements), and its projected cost of power compares favorably to alternative sources of power.

37. Q. Is the HQUS PPA consistent with the principles for resource selection contained in GMP's IRP as required under 30 V.S.A § 248(b)(6)?

A. Yes. The contract is consistent with the resource selection principles and GMP's IRP. First, as indicated above, GMP's approved IRP identifies continued purchases of HQ power as a desirable approach once the current contract expires. GMP IRP at 104-105. Second, the methodology employed in GMP's risk analysis, involving multiple scenarios reflecting variations in the important cost drivers, is consistent with the multi-attribute analysis employed in the IRP. In particular, the Monte Carlo analysis described above tests the PPA under a variety of assumptions concerning the key cost drivers. This analysis is qualitatively similar to the IRP's methodology of testing six alternative portfolios against six key attributes: NPV of future revenue requirements, societal cost NPV, short-term market/fuel price exposure, portion of portfolio hedged with long-term fixed prices, imputed debt and air emissions. GMP IRP at 91. Ultimately, both the IRP

and the PPA analysis described above favor a portfolio that includes significant amounts of Hydro-Québec power.

38. Q. Does this conclude your testimony?

A. Yes.

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